

Code No: R10202/R10

Set No. 1

**I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICS- II**

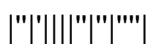
(Common to Civil Engineering, Electrical & Electronics Engineering,
Mechanical Engineering, Electronics & Communication Engineering,
Computer Science & Engineering, Chemical Engineering, Electronics &
Instrumentation Engineering, Bio-Medical Engineering, Information
Technology, Electronics & Computer Engineering, Aeronautical
Engineering, Bio-Technology, Automobile Engineering, Mining and
Petroleum Technology)

Time: 3 hours

Max Marks: 75

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Find $L(t e^{2t} \sin 3t)$
 (b) Find $L\left(\frac{\sin t}{t}\right)$ [7+8]
2. (a) Find $L^{-1}\left[\frac{s-3}{s^2-10s+29}\right]$.
 (b) Find $L^{-1}\left[\log\left(\frac{s^2+4}{s^2+9}\right)\right]$. [7+8]
3. Find the fouries series for the function
 $f(x) = -\pi, -\pi < x < 0$
 $= \pi, 0 < x < \pi$ and hence deduce the series $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ [15]
4. (a) Find the fourier transform of $f(x)$ defined by $f(x)=e^{iax}, \alpha < x < \beta, f(x) = 0, x < \alpha$ and $x > \beta$
 (b) Find the fourier transform of $f(x)$ defined by $f(x) = e^{-x^2/2}, -8 < x < 8$. [8+7]
5. (a) Form the Partial Differential Equation by eliminating arbitrary functions from $z = y f(x) + x g(y)$
 (b) Solve $p+q=1$ [8+7]
6. An insulated rod of length l has its ends A and B maintained at 0°C and 100°C respectively until steady state conditions prevail. If the ends A and B are changed to 40°C and 60°C and maintained at these values, find the transient distribution of the rod. [15]
7. (a) Find $Z^{-1}\left(\frac{2z^2+3z}{(z+2)(z-4)}\right)$
 (b) Find the inverse Z-transform of $\frac{5z}{(2-z)(3z-1)}$. [8+7]
8. (a) Prove that $\beta(m, n) = a^m b^n \int_0^\infty \frac{x^{m-1}}{(ax+b)^{m+n}} dx$, where $a, b > 0$.
 (b) Express $\int_0^1 \frac{1}{(1-x^3)^{1/3}} dx$ in terms of gamma functions. [8+7]



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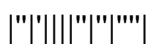
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Time: 3 hours

Max Marks: 75

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Find the Laplace transform of $e^{5t} + e^{-2t} - \sin 5t + \cos 4t - \sinh 2t + 5 \cosh 3t + t^5 - 9$
- (b) Find the Laplace transform of $t^2 \sin 2t$ [7+8]
2. (a) Find inverse Laplace transform of $\frac{4s+5}{(s-1)^2(s-2)}$
- (b) Find inverse Laplace transform of $\frac{1}{s(s+3)^3}$ [7+8]
3. Obtain the half range cosine and sine series for $f(x)=x$ in $0 < x < L$ [15]
4. Find the fourier sine transform of $f(x) = \frac{1}{x(x^2+a^2)}$ [15]
5. (a) Solve $p-q=z-y$
- (b) Solve $(x-a)p + (y-b)q = z-c$ [8+7]
6. (a) Solve $3u_x + 2u_y = 0$ and $u(x,0) = 4e^{-x}$ by the Method of Separation of Variables.
- (b) Solve $\frac{d^2z}{dx^2} - 2\frac{dz}{dx} + \frac{dz}{dy} = 0$ by the Method of Separation of Variables. [8+7]
7. (a) Find $Z^{-1} \left(\frac{3z^2+z}{(5z-1)(5z+2)} \right)$.
- (b) Find $Z^{-1} \left(\frac{z^2-3z}{(z+2)(z-5)} \right)$ [8+7]
8. (a) Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.
- (b) Express $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta$ in terms of gamma functions. [8+7]



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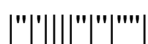
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Time: 3 hours

Max Marks: 75

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Find the Laplace transform of $t \sin 2t \cos 2t$
(b) Find $L(t^2 \cos 2t)$ [7+8]
2. (a) Find $L^{-1}[e^{-2s}/(s^2 + 4s + 5)]$.
(b) Find $L^{-1}[\log(\frac{s+1}{s-1})]$. [7+8]
3. Find the fourier series for $f(x)=2Lx-x^2$ in $0 < x < 2L$ and hence deduce $1-1/2^2+1/3^2-1/4^2+\dots=\pi^2/12$ [15]
4. Find the fourier sine transform of $f(x) = \begin{cases} 1 - x^2, & |z| < 1 \\ 0 & |z| > 1 \end{cases}$ [15]
5. (a) Form the Partial Differential Equation by eliminating arbitrary function from $f(x^2+y^2, z-xy) = 0$
(b) Solve $pq=xy$ [8+7]
6. A tightly stretched string of length l with fixed end points is initially at rest in its equilibrium position and each of its points is given a velocity $v(x)$ such that $v(x) = \begin{cases} cx, & 0 \leq x \leq \frac{l}{2} \\ c(l-x), & \frac{l}{2} \leq x \leq l \end{cases}$ find the displacement of any point on the string at any time 't'. [15]
7. (a) Find the Z-transforms of (i) $e^{-an} \sin n\theta$ (ii) $3n^2 + 10 \cos(\frac{n\pi}{2}) + a^{n+2}$.
(b) Find the Z-transforms of (i) $(n-1)^2$ (ii) $5e^{-an} \sin(\frac{n\pi}{4}) - 3a^4$. [8+7]
8. (a) Show that $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$
(b) Prove that $\beta(m+1, n) + \beta(m, n+1) = \beta(m, n)$ [8+7]



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Time: 3 hours

Max Marks: 75

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Find the Laplace transform of $\cos 3t \sin 5t$
(b) Find the Laplace transform of $\frac{1-e^{-t}}{t}$ [7+8]
2. (a) Find $L^{-1}[(2s + 3)/(s^3 - 6s^2 + 11s - 6)]$.
(b) Find $L^{-1} \{ \cot^{-1} s \}$. [7+8]
3. $f(x) = kx$, for $0 < x < \frac{\pi}{2}$
 $k(\pi - x)$, for $\frac{\pi}{2} < x < \pi$ find the half range sine series [15]
4. (a) Find the inverse fourier cosine transform of $f(x)$ of $F_c(p) = 1/2a(a-p/2)$ when $p < 2a$, $F_c(p) = 0$ when $p = 2a$
(b) Find the fourier cosine transform of $f(x) = e^{-ax} \cos ax$ [8+7]
5. (a) Form the Partial Differential Equation by eliminating arbitrary function from $f(x+z, y+z) = 0$.
(b) Solve $x(y^2-z^2)p + y(z^2-x^2)q = z(x^2-y^2)$ [8+7]
6. Solve $\frac{\partial^2 u}{\partial t^2} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$, $-\alpha < x < \alpha$, $t \geq 0$ with conditions $u(x, 0) = f(x)$ and $(\frac{\partial u}{\partial t})_{(x,0)} = g(x)$ assuming $u, \frac{\partial u}{\partial t} \rightarrow 0$ as $x \rightarrow \alpha$. [15]
7. (a) Find the inverse Z-transform of $\frac{z}{(z-1)(z-2)}$
(b) Determine u_2 where $U(z) = \frac{2z^2+3z+4}{(z-3)^3}$, $|z| > 3$ [8+7]
8. (a) Show that $\int_{-1}^1 (1+x)^{m-1} (1-x)^{n-1} dx = 2^{m+n-1} \beta(m, n)$
(b) Show that $\int_0^\infty \frac{x^n}{n^x} dx = \frac{\Gamma(n+1)}{(\log n)^{n+1}}$, $n > 1$ [8+7]

